

SEQUENCE LISTING

<110> CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE (CNRS)
 UNIVERSITE PARIS SUD XI
 GUILHOT, Christophe
 DAFRE, Mamadou
 HOUSSIN, Christine
 PORTEVIN, Damien
 DE SOUSA, Célia

<120> USE OF PKS 13 PROTEIN CODING FOR CONDENSASE OF MYCOLIC
 ACIDS OF MYCOBACTERIA AND RELATED STRAINS AS AN
 ANTIBIOTICS TARGET

<130> MJPVMAah644-112

<160> 31

<170> PatentIn version 3.1

<210> 1
 <211> 1733
 <212> PRT
 <213> Mycobacterium tuberculosis

<400> 1
 Met Ala Asp Val Ala Glu Ser Gln Glu Asn Ala Pro Ala Glu Arg Ala
 1 5 10 15
 Glu Leu Thr Val Pro Glu Met Arg Gln Trp Leu Arg Asn Trp Val Gly
 20 25 30
 Lys Ala Val Gly Lys Ala Pro Asp Ser Ile Asp Glu Ser Val Pro Met
 35 40 45
 Val Glu Leu Gly Leu Ser Ser Arg Asp Ala Val Ala Met Ala Ala Asp
 50 55 60
 Ile Glu Asp Leu Thr Gly Val Thr Leu Ser Val Ala Val Ala Phe Ala
 65 70 75 80
 His Pro Thr Ile Glu Ser Leu Ala Thr Arg Ile Ile Glu Gly Glu Pro
 85 90 95
 Glu Thr Asp Leu Ala Gly Asp Asp Ala Glu Asp Trp Ser Arg Thr Gly
 100 105 110
 Pro Ala Glu Arg Val Asp Ile Ala Ile Val Gly Leu Ser Thr Arg Phe
 115 120 125
 Pro Gly Glu Met Asn Thr Pro Glu Gln Thr Trp Gln Ala Leu Leu Glu
 130 135 140
 Gly Arg Asp Gly Ile Thr Asp Leu Pro Asp Gly Arg Trp Ser Glu Phe

145					150					155				160		
Leu	Glu	Glu	Pro	Arg	Leu	Ala	Ala	Arg	Val	Ala	Gly	Ala	Arg	Thr	Arg	
				165					170					175		
Gly	Gly	Tyr	Leu	Lys	Asp	Ile	Lys	Gly	Phe	Asp	Ser	Glu	Phe	Phe	Ala	
			180					185					190			
Val	Ala	Lys	Thr	Glu	Ala	Asp	Asn	Ile	Asp	Pro	Gln	Gln	Arg	Met	Ala	
		195					200					205				
Leu	Glu	Leu	Thr	Trp	Glu	Ala	Leu	Glu	His	Ala	Arg	Ile	Pro	Ala	Ser	
	210					215					220					
Ser	Leu	Arg	Gly	Gln	Ala	Val	Gly	Val	Tyr	Ile	Gly	Ser	Ser	Thr	Asn	
225					230				235						240	
Asp	Tyr	Ser	Phe	Leu	Ala	Val	Ser	Asp	Pro	Thr	Val	Ala	His	Pro	Tyr	
				245					250					255		
Ala	Ile	Thr	Gly	Thr	Ser	Ser	Ser	Ile	Ile	Ala	Asn	Arg	Val	Ser	Tyr	
			260					265					270			
Phe	Tyr	Asp	Phe	His	Gly	Pro	Ser	Val	Thr	Ile	Asp	Thr	Ala	Cys	Ser	
		275					280					285				
Ser	Ser	Leu	Val	Ala	Ile	His	Gln	Gly	Val	Gln	Ala	Leu	Arg	Asn	Gly	
	290					295					300					
Glu	Ala	Asp	Val	Val	Val	Ala	Gly	Gly	Val	Asn	Ala	Leu	Ile	Thr	Pro	
305					310					315					320	
Met	Val	Thr	Leu	Gly	Phe	Asp	Glu	Ile	Gly	Ala	Val	Leu	Ala	Pro	Asp	
				325					330					335		
Gly	Arg	Ile	Lys	Ser	Phe	Ser	Ala	Asp	Ala	Asp	Gly	Tyr	Thr	Arg	Ser	
			340					345					350			
Glu	Gly	Gly	Gly	Met	Leu	Val	Leu	Lys	Arg	Val	Asp	Asp	Ala	Arg	Arg	
		355					360					365				
Asp	Gly	Asp	Ala	Ile	Leu	Ala	Val	Ile	Ala	Gly	Ser	Ala	Val	Asn	His	
	370					375					380					
Asp	Gly	Arg	Ser	Asn	Gly	Leu	Ile	Ala	Pro	Asn	Gln	Asp	Ala	Gln	Ala	
385					390					395					400	
Asp	Val	Leu	Arg	Arg	Ala	Tyr	Lys	Asp	Ala	Gly	Ile	Asp	Pro	Arg	Thr	
				405					410					415		
Val	Asp	Tyr	Ile	Glu	Ala	His	Gly	Thr	Gly	Thr	Ile	Leu	Gly	Asp	Pro	
			420					425					430			
Ile	Glu	Ala	Glu	Ala	Leu	Gly	Arg	Val	Val	Gly	Arg	Gly	Arg	Pro	Ala	
		435					440					445				

Asp	Arg	Pro	Ala	Leu	Leu	Gly	Ala	Val	Lys	Thr	Asn	Val	Gly	His	Leu	450	455	460
Glu	Ser	Ala	Ala	Gly	Ala	Ala	Ser	Met	Ala	Lys	Val	Val	Leu	Ala	Leu	465	470	475
Gln	His	Asp	Lys	Leu	Pro	Pro	Ser	Ile	Asn	Phe	Ala	Gly	Pro	Ser	Pro	485	490	495
Tyr	Ile	Asp	Phe	Asp	Ala	Met	Arg	Leu	Lys	Met	Ile	Thr	Thr	Pro	Thr	500	505	510
Asp	Trp	Pro	Arg	Tyr	Gly	Gly	Tyr	Ala	Leu	Ala	Gly	Val	Ser	Ser	Phe	515	520	525
Gly	Phe	Gly	Gly	Ala	Asn	Ala	His	Val	Val	Val	Arg	Glu	Val	Leu	Pro	530	535	540
Arg	Asp	Val	Val	Glu	Lys	Glu	Pro	Glu	Pro	Glu	Pro	Glu	Pro	Lys	Ala	545	550	555
Ala	Ala	Glu	Pro	Ala	Glu	Ala	Pro	Thr	Leu	Ala	Gly	His	Ala	Leu	Arg	565	570	575
Phe	Asp	Glu	Phe	Gly	Asn	Ile	Ile	Thr	Asp	Ser	Ala	Val	Ala	Glu	Glu	580	585	590
Pro	Glu	Pro	Glu	Leu	Pro	Gly	Val	Thr	Glu	Glu	Ala	Leu	Arg	Leu	Lys	595	600	605
Glu	Ala	Ala	Leu	Glu	Glu	Leu	Ala	Ala	Gln	Glu	Val	Thr	Ala	Pro	Leu	610	615	620
Val	Pro	Leu	Ala	Val	Ser	Ala	Phe	Leu	Thr	Ser	Arg	Lys	Lys	Ala	Ala	625	630	635
Ala	Ala	Glu	Leu	Ala	Asp	Trp	Met	Gln	Ser	Pro	Glu	Gly	Gln	Ala	Ser	645	650	655
Ser	Leu	Glu	Ser	Ile	Gly	Arg	Ser	Leu	Ser	Arg	Arg	Asn	His	Gly	Arg	660	665	670
Ser	Arg	Ala	Val	Val	Leu	Ala	His	Asp	His	Asp	Glu	Ala	Ile	Lys	Gly	675	680	685
Leu	Arg	Ala	Val	Ala	Ala	Gly	Lys	Gln	Ala	Pro	Asn	Val	Phe	Ser	Val	690	695	700
Asp	Gly	Pro	Val	Thr	Thr	Gly	Pro	Val	Trp	Val	Leu	Ala	Gly	Phe	Gly	705	710	715
Ala	Gln	His	Arg	Lys	Met	Gly	Lys	Ser	Leu	Tyr	Leu	Arg	Asn	Glu	Val	725	730	735
Phe	Ala	Ala	Trp	Ile	Glu	Lys	Val	Asp	Ala	Leu	Val	Gln	Asp	Glu	Leu	740	745	750

Gly	Tyr	Ser	Val	Leu	Glu	Leu	Ile	Leu	Asp	Asp	Ala	Gln	Asp	Tyr	Gly	
		755					760					765				
Ile	Glu	Thr	Thr	Gln	Val	Thr	Ile	Phe	Ala	Ile	Gln	Ile	Ala	Leu	Gly	
	770					775					780					
Glu	Leu	Leu	Arg	His	His	Gly	Ala	Lys	Pro	Ala	Ala	Val	Ile	Gly	Gln	
785					790					795					800	
Ser	Leu	Gly	Glu	Ala	Ala	Ser	Ala	Tyr	Phe	Ala	Gly	Gly	Leu	Ser	Leu	
				805					810					815		
Arg	Asp	Ala	Thr	Arg	Ala	Ile	Cys	Ser	Arg	Ser	His	Leu	Met	Gly	Glu	
			820					825					830			
Gly	Glu	Ala	Met	Leu	Phe	Gly	Glu	Tyr	Ile	Arg	Leu	Met	Ala	Leu	Val	
		835					840					845				
Glu	Tyr	Ser	Ala	Asp	Glu	Ile	Arg	Glu	Val	Phe	Ser	Asp	Phe	Pro	Asp	
	850					855					860					
Leu	Glu	Val	Cys	Val	Tyr	Ala	Ala	Pro	Thr	Gln	Thr	Val	Ile	Gly	Gly	
865					870					875					880	
Pro	Pro	Glu	Gln	Val	Asp	Ala	Ile	Leu	Ala	Arg	Ala	Glu	Ala	Glu	Gly	
				885					890						895	
Lys	Phe	Ala	Arg	Lys	Phe	Ala	Thr	Lys	Gly	Ala	Ser	His	Thr	Ser	Gln	
			900					905					910			
Met	Asp	Pro	Leu	Leu	Gly	Glu	Leu	Thr	Ala	Glu	Leu	Gln	Gly	Ile	Lys	
		915					920					925				
Pro	Thr	Ser	Pro	Thr	Cys	Gly	Ile	Phe	Ser	Thr	Val	His	Glu	Gly	Arg	
	930					935					940					
Tyr	Ile	Lys	Pro	Gly	Gly	Glu	Pro	Ile	His	Asp	Val	Glu	Tyr	Trp	Lys	
945					950					955					960	
Lys	Gly	Leu	Arg	His	Ser	Val	Tyr	Phe	Thr	His	Gly	Ile	Arg	Asn	Ala	
				965					970					975		
Val	Asp	Ser	Gly	His	Thr	Thr	Phe	Leu	Glu	Leu	Ala	Pro	Asn	Pro	Val	
			980					985					990			
Ala	Leu	Met	Gln	Val	Ala	Leu	Thr	Thr	Ala	Asp	Ala	Gly	Leu	His	Asp	
		995					1000					1005				
Ala	Gln	Leu	Ile	Pro	Thr	Leu	Ala	Arg	Lys	Gln	Asp	Glu	Val	Ser	Ser	
	1010					1015					1020					
Met	Val	Ser	Thr	Met	Ala	Gln	Leu	Tyr	Val	Tyr	Gly	His	Asp	Leu	Asp	
1025					1030					1035					1040	
Ile	Arg	Thr	Leu	Phe	Ser	Arg	Ala	Ser	Gly	Pro	Gln	Asp	Tyr	Ala	Asn	
				1045					1050					1055		

Ile	Pro	Pro	Thr	Arg	Phe	Lys	Arg	Lys	Glu	His	Trp	Leu	Pro	Ala	His
			1060						1065			1070			
Phe	Ser	Gly	Asp	Gly	Ser	Thr	Tyr	Met	Pro	Gly	Thr	His	Val	Ala	Leu
			1075						1080			1085			
Pro	Asp	Gly	Arg	His	Val	Trp	Glu	Tyr	Ala	Pro	Arg	Asp	Gly	Asn	Val
			1090						1095			1100			
Asp	Leu	Ala	Ala	Leu	Val	Arg	Ala	Ala	Ala	Ala	His	Val	Leu	Pro	Asp
			1105						1110			1115			
Ala	Gln	Leu	Thr	Ala	Ala	Glu	Gln	Arg	Ala	Val	Pro	Gly	Asp	Gly	Ala
			1125						1130			1135			
Arg	Leu	Val	Thr	Thr	Met	Thr	Arg	His	Pro	Gly	Gly	Ala	Ser	Val	Gln
			1140						1145			1150			
Val	His	Ala	Arg	Ile	Asp	Glu	Ser	Phe	Thr	Leu	Val	Tyr	Asp	Ala	Leu
			1155						1160			1165			
Val	Ser	Arg	Ala	Gly	Ser	Glu	Ser	Val	Leu	Pro	Thr	Ala	Val	Gly	Ala
			1170						1175			1180			
Ala	Thr	Ala	Ile	Ala	Val	Ala	Asp	Gly	Ala	Pro	Val	Ala	Pro	Glu	Thr
			1185						1190			1195			
Pro	Ala	Glu	Asp	Ala	Asp	Ala	Glu	Thr	Leu	Ser	Asp	Ser	Leu	Thr	Thr
			1205						1210			1215			
Arg	Tyr	Met	Pro	Ser	Gly	Met	Thr	Arg	Trp	Ser	Pro	Asp	Ser	Gly	Glu
			1220						1225			1230			
Thr	Ile	Ala	Glu	Arg	Leu	Gly	Leu	Ile	Val	Gly	Ser	Ala	Met	Gly	Tyr
			1235						1240			1245			
Glu	Pro	Glu	Asp	Leu	Pro	Trp	Glu	Val	Pro	Leu	Ile	Glu	Leu	Gly	Leu
			1250						1255			1260			
Asp	Ser	Leu	Met	Ala	Val	Arg	Ile	Lys	Asn	Arg	Val	Glu	Tyr	Asp	Phe
			1265						1270			1275			
Asp	Leu	Pro	Pro	Ile	Gln	Leu	Thr	Ala	Val	Arg	Asp	Ala	Asn	Leu	Tyr
			1285						1290			1295			
Asn	Val	Glu	Lys	Leu	Ile	Glu	Tyr	Ala	Val	Glu	His	Arg	Asp	Glu	Val
			1300						1305			1310			
Gln	Gln	Leu	His	Glu	His	Gln	Lys	Thr	Gln	Thr	Ala	Glu	Glu	Ile	Ala
			1315						1320			1325			
Arg	Ala	Gln	Ala	Glu	Leu	Leu	His	Gly	Lys	Val	Gly	Lys	Thr	Glu	Pro
			1330						1335			1340			
Val	Asp	Ser	Glu	Ala	Gly	Val	Ala	Leu	Pro	Ser	Pro	Gln	Asn	Gly	Glu
			1345						1350			1355			
												1360			

Gln Pro Asn Pro Thr Gly Pro Ala Leu Asn Val Asp Val Pro Pro Arg
 1365 1370 1375
 Asp Ala Ala Glu Arg Val Thr Phe Ala Thr Trp Ala Ile Val Thr Gly
 1380 1385 1390
 Lys Ser Pro Gly Gly Ile Phe Asn Glu Leu Pro Arg Leu Asp Asp Glu
 1395 1400 1405
 Ala Ala Ala Lys Ile Ala Gln Arg Leu Ser Glu Arg Ala Glu Gly Pro
 1410 1415 1420
 Ile Thr Ala Glu Asp Val Leu Thr Ser Ser Asn Ile Glu Ala Leu Ala
 1425 1430 1435 1440
 Asp Lys Val Arg Thr Tyr Leu Glu Ala Gly Gln Ile Asp Gly Phe Val
 1445 1450 1455
 Arg Thr Leu Arg Ala Arg Pro Glu Ala Gly Gly Lys Val Pro Val Phe
 1460 1465 1470
 Val Phe His Pro Ala Gly Gly Ser Thr Val Val Tyr Glu Pro Leu Leu
 1475 1480 1485
 Gly Arg Leu Pro Ala Asp Thr Pro Met Tyr Gly Phe Glu Arg Val Glu
 1490 1495 1500
 Gly Ser Ile Glu Glu Arg Ala Gln Gln Tyr Val Pro Lys Leu Ile Glu
 1505 1510 1515 1520
 Met Gln Gly Asp Gly Pro Tyr Val Leu Val Gly Trp Ser Leu Gly Gly
 1525 1530 1535
 Val Leu Ala Tyr Ala Cys Ala Ile Gly Leu Arg Arg Leu Gly Lys Asp
 1540 1545 1550
 Val Arg Phe Val Gly Leu Ile Asp Ala Val Arg Ala Gly Glu Glu Ile
 1555 1560 1565
 Pro Gln Thr Lys Glu Glu Ile Arg Lys Arg Trp Asp Arg Tyr Ala Ala
 1570 1575 1580
 Phe Ala Glu Lys Thr Phe Asn Val Thr Ile Pro Ala Ile Pro Tyr Glu
 1585 1590 1595 1600
 Gln Leu Glu Glu Leu Asp Asp Glu Gly Gln Val Arg Phe Val Leu Asp
 1605 1610 1615
 Ala Val Ser Gln Ser Gly Val Gln Ile Pro Ala Gly Ile Ile Glu His
 1620 1625 1630
 Gln Arg Thr Ser Tyr Leu Asp Asn Arg Ala Ile Asp Thr Ala Gln Ile
 1635 1640 1645

Gln Pro Tyr Asp Gly His Val Thr Leu Tyr Met Ala Asp Arg Tyr His
 1650 1655 1660
 Asp Asp Ala Ile Met Phe Glu Pro Arg Tyr Ala Val Arg Gln Pro Asp
 1665 1670 1675 1680
 Gly Gly Trp Gly Glu Tyr Val Ser Asp Leu Glu Val Val Pro Ile Gly
 1685 1690 1695
 Gly Glu His Ile Gln Ala Ile Asp Glu Pro Ile Ile Ala Lys Val Gly
 1700 1705 1710
 Glu His Met Ser Arg Ala Leu Gly Gln Ile Glu Ala Asp Arg Thr Ser
 1715 1720 1725
 Glu Val Gly Lys Gln
 1730

 <210> 2
 <211> 1610
 <212> PRT
 <213> *Corynebacterium glutamicum*

 <400> 2
 Met Glu Gln Ser Gln Ser Ser Asp Gln Lys Met Thr Val Glu Gln Val
 1 5 10 15
 Arg Thr Trp Leu Arg Asp Trp Val Val Arg Thr Thr Gly Ile Pro Val
 20 25 30
 Glu Glu Val Thr Asp Asp Lys Ala Met Glu Thr Phe Gly Leu Ser Ser
 35 40 45
 Arg Asp Val Val Val Leu Ser Gly Glu Leu Glu Asn Leu Leu Asp Thr
 50 55 60
 Ser Leu Asp Ala Thr Ile Ala Tyr Glu Tyr Pro Thr Ile Arg Ser Leu
 65 70 75 80
 Ala Gln Arg Leu Val Glu Gly Glu Pro Arg Arg Ala His Thr Gln Arg
 85 90 95
 Glu Leu Asn Phe Ser Ala Val Ser Asp Ser Pro Gly Ser His Asp Ile
 100 105 110
 Ala Val Val Gly Met Ala Ala Arg Tyr Pro Gly Ala Glu Ser Leu Glu
 115 120 125
 Asp Met Trp Lys Leu Leu Val Glu Gly Arg Asp Gly Ile Ser Asp Leu
 130 135 140
 Pro Ile Gly Arg Trp Ser Glu Tyr Ala Gly Asp Glu Val Met Ser Arg
 145 150 155 160
 Lys Met Glu Glu Phe Ser Thr Ile Gly Gly Tyr Leu Ser Asp Ile Ser

165								170				175			
Ser	Phe	Asp	Ala	Glu	Phe	Phe	Gly	Leu	Ser	Pro	Leu	Glu	Ala	Ala	Asn
			180					185					190		
Met	Asp	Pro	Gln	Gln	Arg	Ile	Leu	Leu	Glu	Leu	Thr	Trp	Glu	Ala	Leu
		195					200					205			
Glu	Tyr	Ala	Arg	Ile	Ala	Pro	Asn	Thr	Leu	Arg	Gly	Glu	Ala	Val	Gly
	210					215					220				
Val	Phe	Ile	Gly	Ser	Ser	Asn	Asn	Asp	Tyr	Gly	Met	Met	Ile	Ala	Ala
225					230				235						240
Asp	Pro	Ala	Glu	Ala	His	Pro	Tyr	Ala	Leu	Thr	Gly	Thr	Ser	Ser	Ala
			245					250						255	
Ile	Val	Ala	Asn	Arg	Ile	Asn	Tyr	Ala	Phe	Asp	Phe	Arg	Gly	Pro	Ser
		260						265					270		
Val	Asn	Val	Asp	Thr	Ala	Cys	Ser	Ser	Ser	Leu	Val	Ala	Val	His	Gln
		275					280					285			
Ala	Val	Arg	Ala	Leu	Arg	Asn	Gly	Glu	Ala	Asp	His	Ala	Ile	Ala	Gly
	290					295					300				
Gly	Val	Asn	Ile	Leu	Ala	Ser	Pro	Phe	Val	Thr	Thr	Ala	Phe	Ala	Glu
305				310						315					320
Leu	Gly	Val	Ile	Ser	Pro	Thr	Gly	Lys	Ile	His	Ala	Phe	Ser	Asp	Asp
			325					330						335	
Ala	Asp	Gly	Phe	Val	Arg	Ser	Asp	Gly	Ala	Gly	Val	Val	Val	Leu	Lys
		340						345					350		
Arg	Val	Asp	Asp	Ala	Ile	Arg	Asp	Gly	Asp	Lys	Ile	Ile	Gly	Val	Ile
		355					360					365			
Lys	Gly	Ser	Ala	Val	Asn	Ser	Asp	Gly	His	Ser	Asn	Gly	Leu	Thr	Ala
	370				375						380				
Pro	Asn	Pro	Asp	Ala	Gln	Val	Asp	Val	Leu	Gln	Arg	Ala	Tyr	Val	Asp
385					390					395					400
Ala	Gln	Val	Asp	Pro	Thr	Thr	Val	Asp	Tyr	Val	Glu	Ala	His	Gly	Thr
			405					410						415	
Gly	Thr	Ile	Leu	Gly	Asp	Pro	Ile	Glu	Ala	Thr	Ala	Leu	Gly	Ala	Val
			420					425					430		
Leu	Gly	Tyr	Gly	Arg	Asp	Ala	Ser	Thr	Pro	Thr	Leu	Leu	Gly	Ser	Ala
		435				440						445			
Lys	Ser	Asn	Phe	Gly	His	Thr	Glu	Ser	Ala	Ala	Gly	Ile	Ala	Gly	Val
	450					455					460				

Ile	Lys	Val	Leu	Leu	Ala	Leu	Gln	Asn	Lys	Thr	Leu	Pro	Pro	Thr	Val	465	470	475	480
Asn	Phe	Ala	Gly	Pro	Asn	Arg	Tyr	Ile	Asp	Phe	Asp	Ala	Glu	Arg	Leu	485	490	495	
Glu	Val	Val	Glu	Asp	Pro	Arg	Glu	Trp	Pro	Glu	Tyr	Asn	Gly	His	Ala	500	505	510	
Val	Ala	Gly	Val	Ser	Ala	Phe	Gly	Phe	Gly	Gly	Thr	Asn	Ala	His	Val	515	520	525	
Val	Ile	Ser	Glu	Tyr	Asn	Ala	Glu	Asp	Tyr	Glu	Thr	Arg	Ala	Pro	Lys	530	535	540	
Glu	Ala	Leu	Leu	Pro	Asp	Gln	Gln	Val	Ala	Leu	Pro	Val	Ser	Gly	His	545	550	555	560
Leu	Pro	Ser	Arg	Arg	Arg	Gln	Ala	Ala	Ala	Asp	Leu	Ala	Asp	Phe	Leu	565	570	575	
Glu	Gly	Arg	Lys	Asp	Cys	Asp	Leu	Thr	Pro	Val	Ala	Arg	Ala	Leu	Ala	580	585	590	
Gly	Arg	Asn	His	Gly	Arg	Ser	Arg	Ala	Val	Val	Leu	Ala	Ser	Thr	Ile	595	600	605	
Glu	Glu	Ala	Val	Lys	Arg	Leu	Arg	Gln	Val	Ala	Glu	Gly	Lys	Val	Ser	610	615	620	
Val	Gly	Ile	Ser	Ala	Ala	Asp	Ser	Pro	Ala	Ala	Asn	Gly	Pro	Val	Phe	625	630	635	640
Val	Tyr	Ser	Gly	Phe	Gly	Ser	Gln	His	Arg	Leu	Met	Ile	Lys	Glu	Leu	645	650	655	
Cys	Ser	Ile	Ser	Pro	Gln	Phe	Arg	Glu	Arg	Ile	Glu	Glu	Leu	Asp	Glu	660	665	670	
Met	Val	Lys	Phe	Glu	Ser	Gly	Trp	Ser	Ile	Met	Lys	Leu	Val	Leu	Asp	675	680	685	
Asp	Glu	Gln	Thr	Tyr	Asp	Thr	Glu	Thr	Ala	Gln	Val	Val	Ile	Thr	Ala	690	695	700	
Ile	Gln	Ile	Ala	Leu	Thr	Asp	Leu	Leu	Ala	Ser	Phe	Gly	Val	Lys	Pro	705	710	715	720
Ala	Ala	Val	Met	Gly	Met	Ser	Met	Gly	Glu	Ile	Ala	Ala	Ala	Tyr	Ala	725	730	735	
Ala	Gly	Gly	Leu	Ser	Asp	Arg	Asp	Thr	Met	Leu	Ile	Ala	Ser	His	Arg	740	745	750	
Ser	Arg	Leu	Met	Gly	Glu	Gly	Glu	Lys	Ser	Leu	Ala	Glu	Asp	Gln	Leu	755	760	765	

Gly	Ala	Met	Ala	Val	Val	Glu	Phe	Ala	Ala	Ala	Asp	Leu	Asp	Lys	Phe	770	775	780
Ile	Glu	Glu	Asn	Pro	Glu	Tyr	Lys	Gly	Ile	Glu	Pro	Ala	Val	Tyr	Ala	785	790	795
Gly	Pro	Gly	Met	Thr	Thr	Val	Gly	Gly	Pro	Arg	Asp	Ala	Val	Val	Gln	805	810	815
Phe	Val	Glu	Lys	Leu	Glu	Ser	Glu	Asp	Lys	Phe	Ala	Arg	Leu	Leu	Asn	820	825	830
Val	Lys	Gly	Ala	Gly	His	Thr	Ser	Ala	Val	Glu	Pro	Leu	Leu	Gly	Glu	835	840	845
Leu	Ala	Gly	Glu	Ile	Ala	Gly	Ile	Glu	Pro	Leu	Pro	Leu	Gln	Ile	Pro	850	855	860
Leu	Phe	Ser	Ser	Val	Asp	Gln	Gly	Val	Thr	Tyr	Pro	Val	Gly	Ala	Val	865	870	875
Val	His	Asp	Ala	Asp	Tyr	Met	Leu	Arg	Cys	Thr	Arg	Gln	Ser	Val	Tyr	885	890	895
Phe	Gln	Asp	Ser	Thr	Glu	Ala	Ala	Phe	Ala	Ala	Gly	His	Asn	Thr	Leu	900	905	910
Val	Glu	Ile	Ser	Pro	Asn	Pro	Val	Ala	Leu	Met	Gly	Met	Met	Asn	Thr	915	920	925
Ala	Phe	Thr	Val	Gly	Lys	Pro	Asp	Ala	Gln	Leu	Leu	Phe	Ser	Leu	Lys	930	935	940
Arg	Lys	Val	Pro	Glu	Ala	Glu	Ser	Leu	Arg	Asp	Leu	Leu	Ala	Lys	Leu	945	950	955
Tyr	Val	Asn	Gly	Ala	Asn	Val	Asp	Phe	Ser	Ala	Leu	Tyr	Gly	Glu	Gly	965	970	975
Glu	Thr	Ile	Asp	Pro	Pro	His	Ile	Thr	Trp	Lys	His	Gln	Arg	Phe	Trp	980	985	990
Thr	Ser	Ala	Arg	Pro	Ser	Ser	Gly	Ala	Ser	Leu	Asp	Leu	Pro	Gly	Phe	995	1000	1005
Arg	Val	Asn	Leu	Pro	Asn	Asn	Thr	Val	Ala	Phe	Ser	Thr	Ala	Ala	Glu	1010	1015	1020
Leu	Ala	Pro	Ser	Ala	Val	Ala	Ile	Met	Glu	Ala	Ala	Ala	Met	Ala	Val	1025	1030	1035
Thr	Pro	Gly	Ser	Ser	Val	Asp	Ala	Val	Asp	Glu	Arg	Asp	Met	Leu	Pro	1045	1050	1055
Pro	Ser	Gly	Glu	Ile	Thr	Thr	Ile	Val	Thr	Arg	Ser	Leu	Gly	Gly	Leu	1060	1065	1070

Ser	Leu	Ser	Val	Tyr	Lys	Ile	Glu	Gly	Thr	Thr	Ser	Thr	Leu	Val	Ala		
		1075						1080					1085				
Glu	Gly	Phe	Ala	Ala	Asn	Pro	Gly	Phe	Ala	Ala	Ala	Ser	Ser	Phe	Asp		
	1090						1095					1100					
Gly	Pro	Gly	Tyr	Asp	Gly	Phe	Asn	Thr	Asp	Tyr	Ser	Asp	Gln	Pro	Asp		
1105					1110					1115					1120		
Pro	Arg	Ser	Asp	Leu	Pro	Leu	Asp	Ile	Glu	Ala	Val	Arg	Trp	Asp	Pro		
				1125					1130					1135			
Ala	Thr	Glu	Thr	Val	Glu	Glu	Arg	Met	Arg	Ala	Ile	Val	Ser	Glu	Ala		
			1140					1145					1150				
Met	Gly	Tyr	Asp	Val	Asp	Asp	Leu	Pro	Arg	Glu	Leu	Pro	Leu	Ile	Asp		
		1155					1160					1165					
Leu	Gly	Leu	Asp	Ser	Leu	Met	Gly	Met	Arg	Ile	Lys	Asn	Arg	Ile	Glu		
	1170					1175					1180						
Asn	Asp	Phe	Gln	Ile	Pro	Pro	Leu	Gln	Val	Gln	Ala	Leu	Arg	Asp	Ala		
1185					1190					1195					1200		
Ser	Val	Ala	Asp	Val	Val	Ile	Met	Val	Glu	Asn	Met	Val	Ala	Gly	Arg		
			1205						1210					1215			
Ser	Ser	Glu	Thr	Leu	Val	Asp	Ala	Thr	Pro	Gln	Val	Pro	Ala	Glu	Ala		
			1220					1225					1230				
Ala	Gly	Glu	Ala	Gln	Ala	Ala	Glu	Ser	Ser	Ala	Ser	Gly	Glu	Asp	Val		
	1235						1240					1245					
Gln	Gly	Val	Gly	Val	Ala	Pro	Arg	Asp	Ala	Ser	Glu	Arg	Met	Val	Phe		
	1250					1255					1260						
Gly	Thr	Trp	Ala	Gly	Leu	Thr	Gly	Ala	Ala	Ala	Ala	Gly	Val	Thr	Ser		
1265					1270					1275					1280		
Lys	Leu	Pro	Gln	Ile	Asp	Val	Asp	Thr	Ala	Thr	Ala	Ile	Ala	Glu	Arg		
			1285					1290					1295				
Leu	Thr	Glu	Arg	Ser	Gly	Ile	Glu	Ile	Ser	Thr	Glu	Gln	Val	Leu	Ala		
			1300					1305					1310				
Ala	Glu	Thr	Leu	Glu	Pro	Leu	Ser	Asp	Leu	Val	Arg	Glu	Gly	Leu	Glu		
	1315						1320					1325					
Thr	Glu	Val	Gln	Gly	Asn	Ile	Arg	Val	Leu	Arg	Gly	Arg	Ala	Glu	Gly		
	1330				1335						1340						
Ser	Thr	Lys	Pro	Ala	Val	Phe	Met	Phe	His	Pro	Ala	Gly	Gly	Ser	Ser		
1345					1350					1355					1360		
Val	Val	Tyr	Gln	Pro	Leu	Met	Arg	Arg	Leu	Pro	Glu	Asp	Val	Pro	Val		
			1365						1370					1375			

Tyr Gly Val Glu Arg Leu Glu Gly Asp Leu Ala Asp Arg Ala Ala Ala
 1380 1385 1390
 Tyr Val Asp Asp Ile Lys Lys Tyr Ser Asp Gly Phe Pro Val Val Leu
 1395 1400 1405
 Gly Gly Trp Ser Phe Gly Gly Ala Val Ala Phe Glu Val Ala His Gln
 1410 1415 1420
 Leu Val Gly Ser Asp Val Glu Val Ala Thr Val Ala Leu Leu Asp Thr
 1425 1430 1435 1440
 Val Gln Pro Ser Asn Pro Ala Pro Asp Thr Ala Glu Glu Thr Arg Ala
 1445 1450 1455
 Arg Trp Thr Arg Tyr Ala Asp Phe Ala Lys Lys Thr Tyr Gly Leu Asp
 1460 1465 1470
 Phe Glu Val Pro Phe Glu Ile Leu Asp Thr Ile Gly Glu Asp Gly Met
 1475 1480 1485
 Leu Ser Met Met Thr Asp Phe Leu Ala Asn Thr Asp Ala Ser Glu His
 1490 1495 1500
 Gly Leu Ser Ala Gly Val Leu Glu His Gln Arg Ala Ser Phe Val Asp
 1505 1510 1515 1520
 Asn Arg Ile Leu Ala Lys Leu Asn Phe Ala Asp Trp Ala Asn Val Glu
 1525 1530 1535
 Ala Pro Val Ile Leu Phe Arg Ala Glu Arg Met His Asp Gly Ala Ile
 1540 1545 1550
 Glu Leu Glu Pro Asn Tyr Ala Lys Ile Asp Gln Asp Gly Gly Trp Ser
 1555 1560 1565
 Gly Ile Val Asn Asp Leu Glu Ile Val Gln Leu Asn Gly Asp His Leu
 1570 1575 1580
 Ala Val Val Asp Glu Pro Glu Ile Gly Thr Val Gly Ala His Leu Ser
 1585 1590 1595 1600
 Arg Arg Ile Asp Glu Ile Ser Arg Lys Asn
 1605 1610

<210> 3
 <211> 21
 <212> DNA
 <213> Artificial sequence

<220>

<223> PCR primer : pks13a

<400> 3
 gctggarctv acvtgggarg c

<210> 4
 <211> 24
 <212> DNA
 <213> Artificial sequence

<220>
 <223> PCR primer : pks13b

<400> 4
 gtgsgcgttg gydccraavc cgaa

24

<210> 5
 <211> 28
 <212> DNA
 <213> Artificial sequence

<220>
 <223> PCR primer : 13Rtb

<400> 5
 gaggacatat ggctgacgta gcggaatc

28

<210> 6
 <211> 32
 <212> DNA
 <213> Artificial sequence

<220>
 <223> PCR primer : 13Stb

<400> 6
 cggtgaaagc ttctgcttgc ctacctcact tg

32

<210> 7
 <211> 32
 <212> DNA
 <213> Artificial sequence

<220>
 <223> PCR primer : 13Ttb

<400> 7
 gctcggggat cctcactgct tgcctacctc ac

32

<210> 8
 <211> 33
 <212> DNA
 <213> Artificial sequence

<220>

<223> PCR primer : 13Ccg
 <400> 8
 aatatgacta gtagccaatc gtcggatcag aag 33

<210> 9
 <211> 35
 <212> DNA
 <213> Artificial sequence

<220>
 <223> PCR primer : 13Dcg
 <400> 9
 agctctagat ctctaattct tccgagaaat ctcac 35

<210> 10
 <211> 22
 <212> DNA
 <213> Artificial sequence

<220>
 <223> PCR primer : pkdel5
 <400> 10
 gaaatctcga gccacggcga aa 22

<210> 11
 <211> 23
 <212> DNA
 <213> Artificial sequence

<220>
 <223> PCR primer : pkdel2
 <400> 11
 acgattgccg cggttccata ttg 23

<210> 12
 <211> 24
 <212> DNA
 <213> Artificial sequence

<220>
 <223> PCR primer : pkdel3
 <400> 12
 catcctgttc cgcggaacgc atgc 24

<210> 13
 <211> 23

<212> DNA
 <213> Artificial sequence

 <220>
 <223> PCR primer : pkdel4

 <400> 13
 cagcatgatg gagatctgag ggc 23

 <210> 14
 <211> 21
 <212> DNA
 <213> Artificial sequence

 <220>
 <223> PCR primer : fa2

 <400> 14
 tctgaccacc ttccgtgaag c 21

 <210> 15
 <211> 18
 <212> DNA
 <213> Artificial sequence

 <220>
 <223> PCR primer : ac2

 <400> 15
 gaacgagttc agagcttc 18

 <210> 16
 <211> 27
 <212> DNA
 <213> Artificial sequence

 <220>
 <223> PCR primer : K10

 <400> 16
 tatttcgaat ggttcgctgg gtttatc 27

 <210> 17
 <211> 20
 <212> DNA
 <213> Artificial sequence

 <220>
 <223> PCR primer : K7

 <400> 17
 taaaaagctt atcgataccg 20

<210> 18
 <211> 18
 <212> DNA
 <213> Artificial sequence

<220>
 <223> PCR primer : pk1

<400> 18
 gccgtgacgg tatctcgg 18

<210> 19
 <211> 20
 <212> DNA
 <213> Artificial sequence

<220>
 <223> PCR primer : pk2

<400> 19
 ccagggcagt tgcttcaatg 20

<210> 20
 <211> 22
 <212> DNA
 <213> Artificial sequence

<220>
 <223> PCR primer : pk3

<400> 20
 tccggaaaga tctcacgccg cg 22

<210> 21
 <211> 22
 <212> DNA
 <213> Artificial sequence

<220>
 <223> PCR primer : pk4

<400> 21
 gcgtgcgcgc agatctgcta gc 22

<210> 22
 <211> 39
 <212> DNA
 <213> Artificial sequence

<220>

<223> PCR primer : 13F

<400> 22
gctctagagt ttaaacgctg gacctgtcca acgtcaagg 39

<210> 23
<211> 30
<212> DNA
<213> Artificial sequence

<220>
<223> PCR primer : 13G

<400> 23
ggactagtcg tcgaaaccga ccgtcaccag 30

<210> 24
<211> 28
<212> DNA
<213> Artificial sequence

<220>
<223> PCR primer : 13H

<400> 24
ggactagtcg gcatcttcaa cgagttgc 28

<210> 25
<211> 37
<212> DNA
<213> Artificial sequence

<220>
<223> PCR primer : 13I

<400> 25
cccaagcttg tttaaacttg tcgaagtggg tcgacgg 37

<210> 26
<211> 20
<212> DNA
<213> Artificial sequence

<220>
<223> PCR primer : 13J

<400> 26
cttccacgac atggtctgat 20

<210> 27
<211> 20

<212> DNA
 <213> Artificial sequence

<220>

<223> PCR primer : 13K

<400> 27

cacgatcgag tcgagctcga

20

<210> 28

<211> 30

<212> DNA

<213> Artificial sequence

<220>

<223> PCR primer : H1

<400> 28

agcaccagcg gttcgccgt

19

<210> 29

<211> 30

<212> DNA

<213> Artificial sequence

<220>

<223> PCR primer : H2

<400> 29

tgcacgactt cgaggtgttc g

21

<210> 30

<211> 27

<212> DNA

<213> Artificial sequence

<220>

<223> PCR primer : 13R

<400> 30

atgagatctg atgaaaacca cagcgat

27

<210> 31

<211> 28

<212> DNA

<213> Artificial sequence

<220>

<223> PCR primer : 13P

<400> 31

ggactagtct tggcgacggc cttctcac

28